

1.0 SCOPE.

THE PURPOSE OF THIS TEST PLAN IS TO **ENSURE** THAT THE DESIGN OF THE "LOW-LEVEL FM MULTIPLEXING SYSTEM" COMPLIES WITH THE ENVIRONMENTAL REQUIREMENTS OF BOEING AIRPLANE COMPANY SPECIFICATION REPORT NO. D2-9236.

1.1. THE FOLLOWING COMPONENT PARTS ARE INCLUDED IN THIS PROCEDURE.

----- VCO

----- SUMMING AMPLIFIER

----- REFERENCE OSCILLATOR.

2.0. APPLICABLE DOCUMENTS.

THE FOLLOWING DOCUMENTS AND SPECIFICATIONS FORM PART OF THIS TEST PROCEDURE.

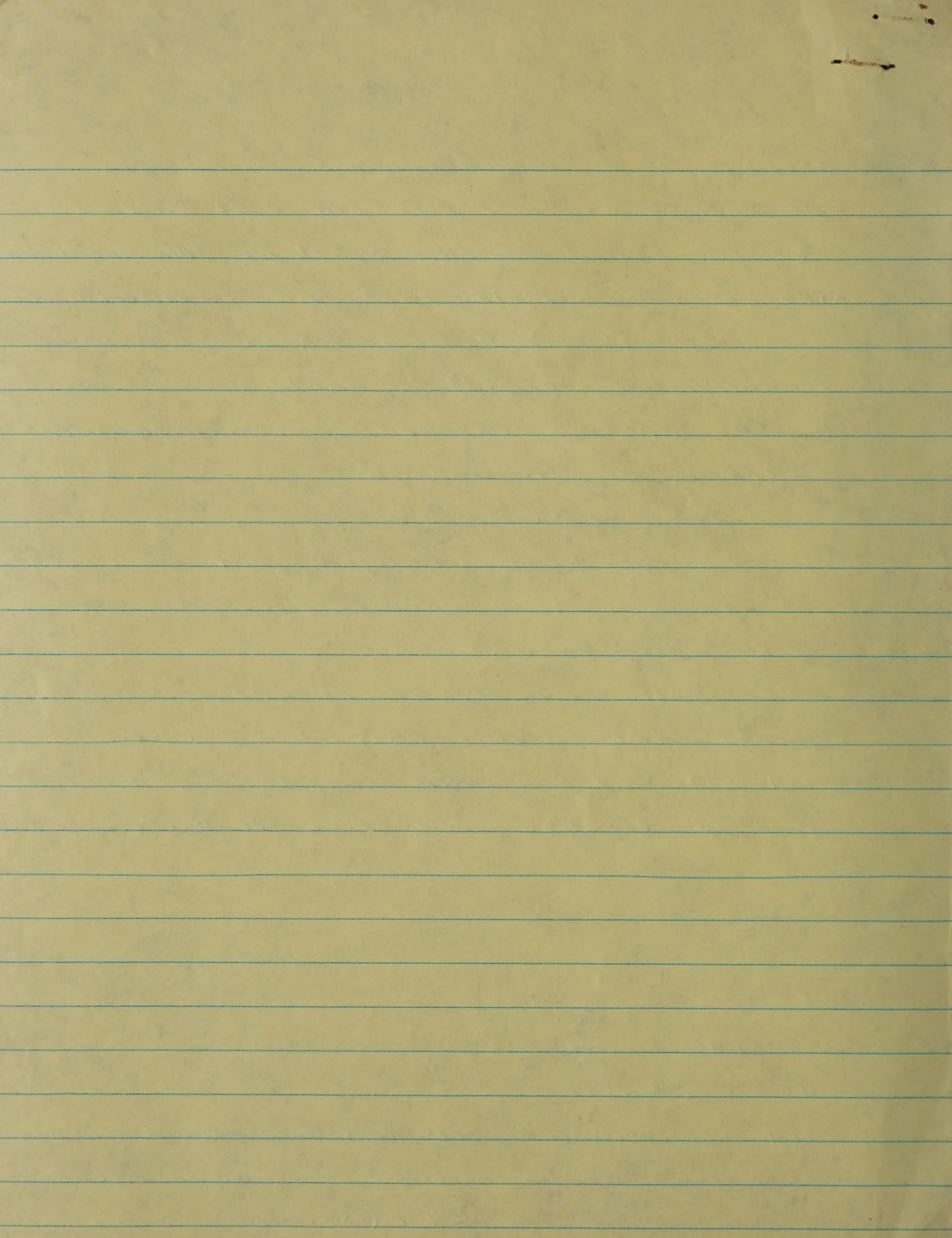
2.1. BOEING AIRPLANE COMPANY SPECIFICATION NO. D2-9236 - LOW-LEVEL FM MULTIPLEXING SYSTEM.

3.0 FACTUAL DATA.

3.1. TOLERANCES.

3.1.1. THE FOLLOWING MAXIMUM ALLOWABLE TOLERANCES WILL PREVAIL DURING ENVIRONMENTAL TESTING.

(a) TEMPERATURE $\pm 4^{\circ}\text{F}$ (EXCLUSIVE OF ACCURACY OF INSTRUMENT)



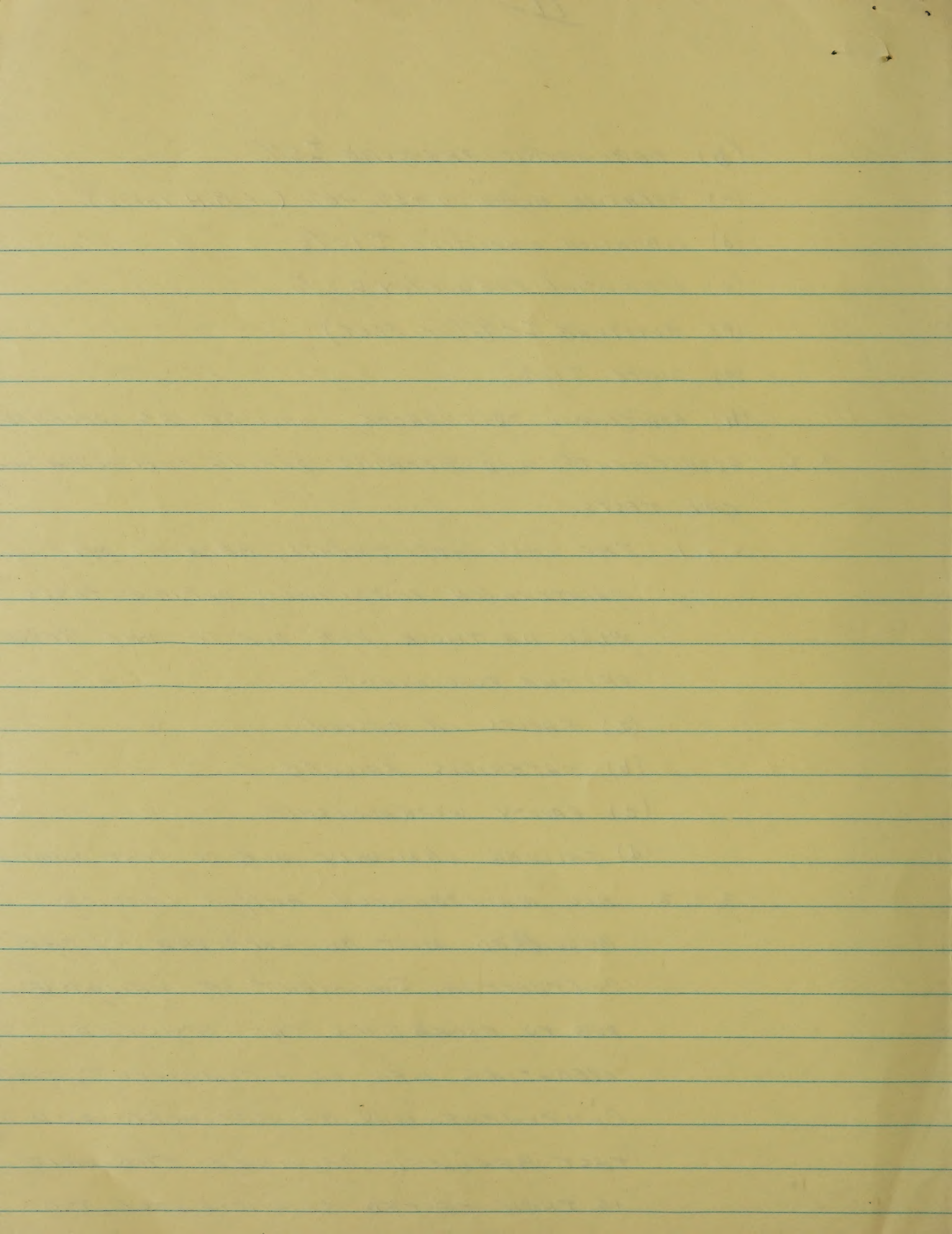
- (b) BAROMETRIC PRESSURE $\pm 5\%$
- (c) RELATIVE HUMIDITY $+5\% - 0\%$ (OF R.H. VALVE)
- (d) VIBRATION AMPLITUDE $\pm 10\%$
- (e) VIBRATION FREQUENCY $\pm 2\%$
- (f) ALTITUDE $\pm 5\%$ (IN FEET)
- (g) SHOCK $\pm 10\%$
- (h) ADDITIONAL TOLERANCES SHALL BE AS SPECIFIED.

3.2. ADJUSTMENTS AND REPAIRS DURING ENVIRONMENTAL TESTS.

3.2.1. THE ONLY ADJUSTMENTS, REPAIRS OR MAINTENANCE PERFORMED DURING TESTS WILL BE THOSE NOT DUE TO THE RESULT OF THE FOLLOWING:

- (a) FAULTS IN DESIGN
- (b) MATERIALS FAILURE
- (c) FAULTY WORKMANSHIP
- (d) FAILURE OBVIOUSLY DUE TO TEST CONDITIONS.

3.2.2. ALL MAINTENANCE AND/OR SERVICE REQUIRED MUST BE APPROVED BY THE CONTRACTOR. IN EVENT OF FAILURE DUE TO EXCEEDING THE DESIGNED OPERATING LIFE OF A COMPONENT, THE COMPONENT MAY BE REPLACED AND TEST RESUMED PROVIDED THE UNIT IS THEN TESTED SUFFICIENTLY TO



SATISFY THE JUDGMENT OF THE TESTING AGENCY AND/OR THE CONTRACTOR.

3.3. TEST EQUIPMENT.

3.3.1 MEASURING INSTRUMENTS USED DURING ENVIRONMENTAL TESTS WILL BE OF LABORATORY PRECISION TYPE WITH CALIBRATION STAMP INDICATING PERIOD FOR WHICH THE INSTRUMENT WAS CALIBRATED AND THE LABORATORY PERFORMING THE CALIBRATION.

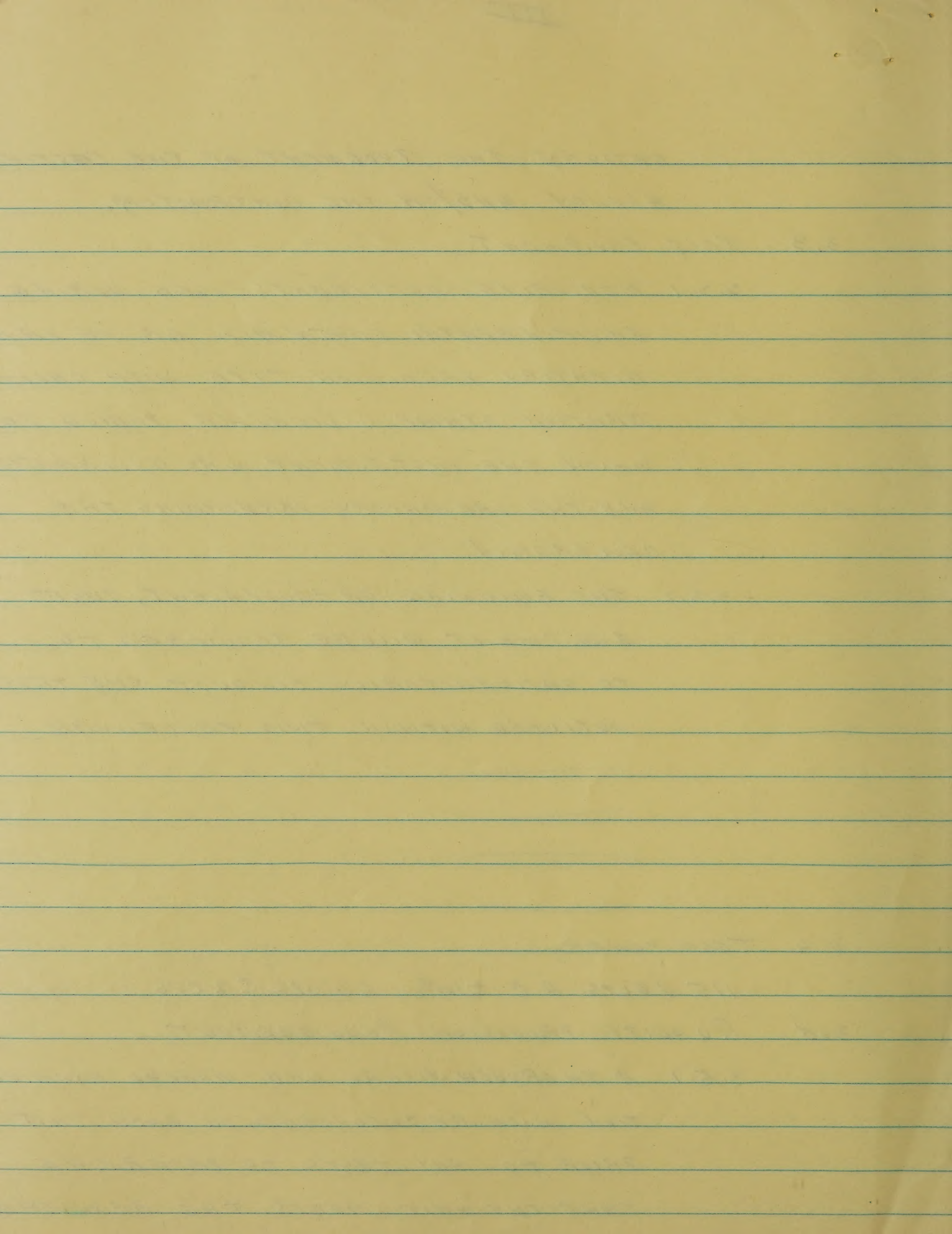
3.3.2. THE FOLLOWING, OR EQUIVALENT, TEST EQUIPMENT WILL BE REQUIRED TO SATISFACTORILY CONDUCT THE TESTS OUTLINED WITHIN THIS PROCEDURE.

3.4. TEST POWER.

115 VOLTS A.C $\pm 10\%$ 60 CPS. ± 2 CPS

3.5. QUALITY PROVISION REQUIREMENT.

3.5.1 A THOROUGH VISUAL AND MANUAL EXAMINATION WILL BE CONDUCTED ON EACH UNIT PRIOR TO ANY TESTS TO DETERMINE THAT THE UNIT MEETS THE REQUIREMENTS.



MENTS OF WORKMANSHIP, MARKING, IDENTIFICATION, FINISH, DIMENSIONS AND CLEANLINESS.

3.5.2. → A PRELIMINARY ACCEPTANCE TEST WILL BE PERFORMED ON THE SYSTEM TO VERIFY PROPER OPERATION UNDER STANDARD CONDITIONS AND A RECORD MADE OF ALL THE DATA. THESE DATA SHALL PROVIDE THE CRITERIA FOR CHECKING PERFORMANCE OF THE SYSTEM DURING AND AFTER ENVIRONMENTAL TESTING.

3.6. ATMOSPHERIC CONDITIONS WHERE NOT OTHERWISE SPECIFIED.

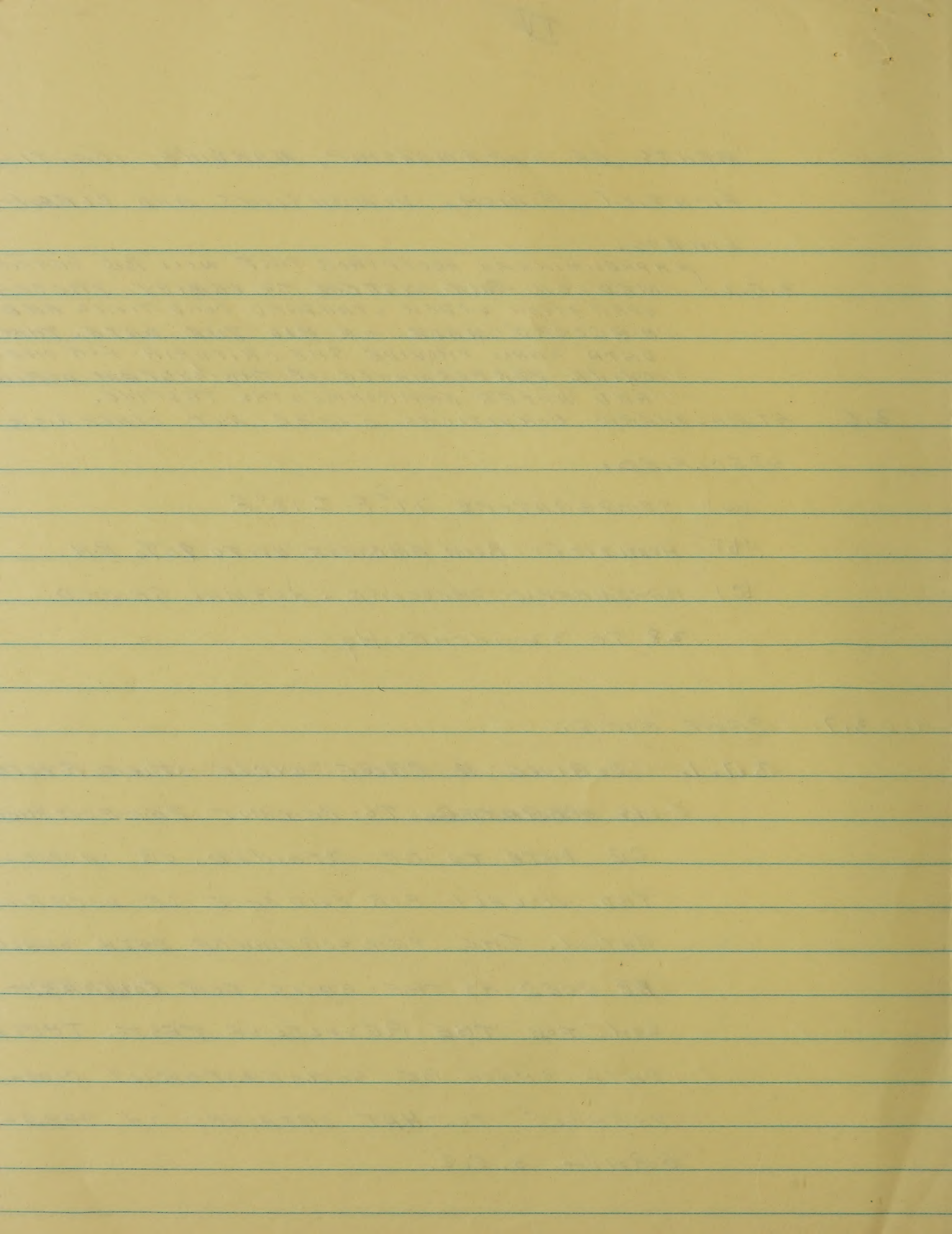
(a) TEMPERATURE $77^{\circ}\text{F} \pm 18^{\circ}\text{F}$.

(b) HUMIDITY - ROOM AMBIENT UP TO 90% R.H.

(c) BAROMETRIC PRESSURE - NORMAL GROUND
28 TO 32 INCHES Hg

3.7. PROOF CYCLE.

3.7.1. DURING A PROOF CYCLE THE SYSTEM IS OPERATED TO PERMIT PERFORMANCE DATA TO BE OBTAINED, OR INSPECTED VISUALLY FOR EVIDENCE OF DEGRADATION. THE PERFORMANCE DATA SHALL BE USED AS THE BASIS FOR COMPARISON FOR THE RESULTS OF TESTS. THESE DATA SHALL BE SATISFACTORILY COMPARABLE TO THAT OBTAINED IN PARAGRAPH 3.5.2.



4.0 TEST PROCEDURE.

THE FOLLOWING PARAGRAPHS OUTLINE THE ENVIRONMENTAL TESTS TO BE CONDUCTED.

4.1 Non-OPERATING TESTS

4.1.1 HIGH AND LOW TEMPERATURE TEST.

4.1.1.1. THE SYSTEM WILL BE PLACED WITHIN THE TEMPERATURE CHAMBER AND THE INTERNAL TEMPERATURE OF THE CHAMBER RAISED TO 125° F WITH AN INTERNAL RELATIVE HUMIDITY OF NOT MORE THAN 15%.

CHISEN ON INCORPORATING ALTITUDE HERE

THIS CONDITION SHALL BE MAINTAINED FOR A PERIOD OF (48)^(?) HOURS.

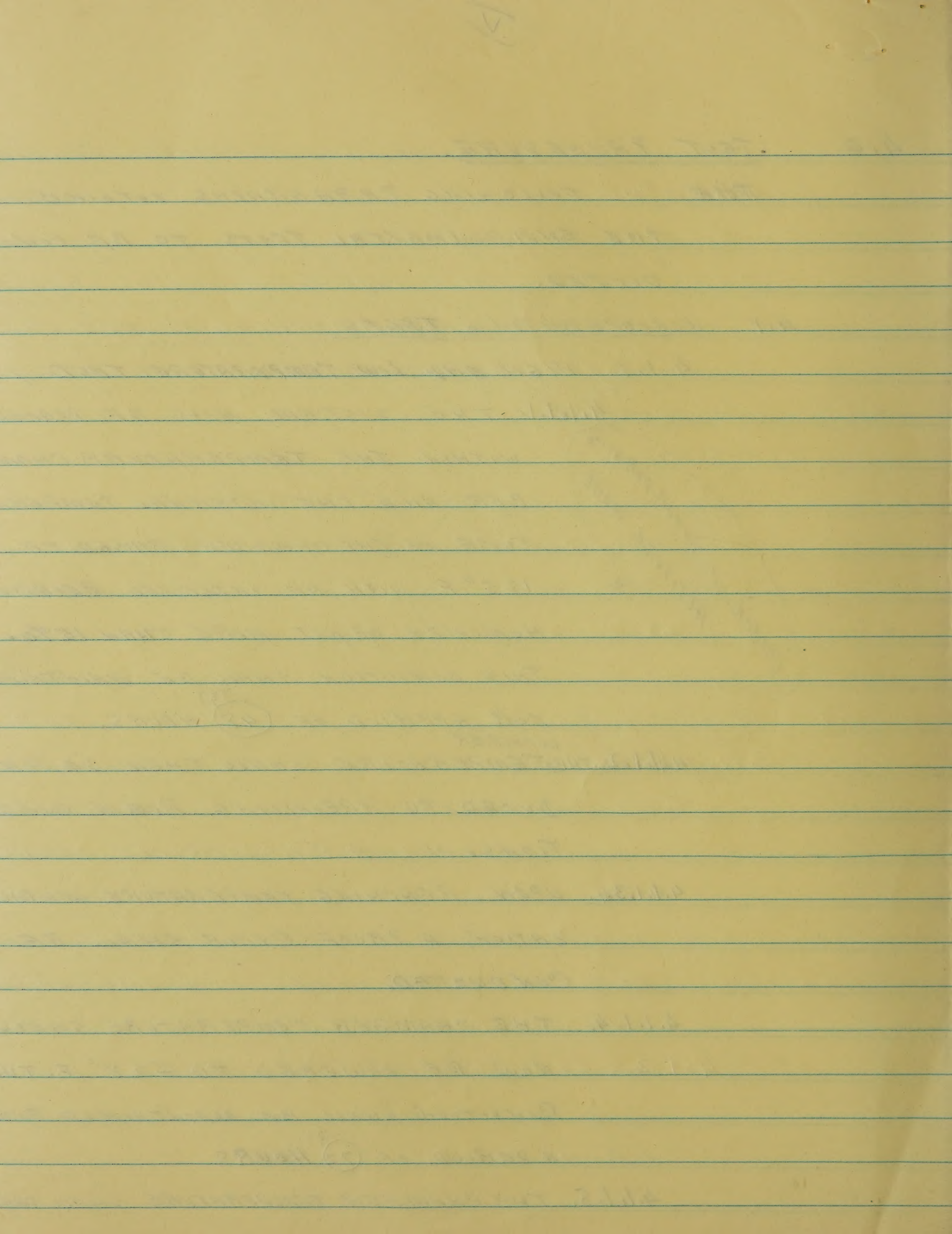
CHAMBER

4.1.1.2. THE TEMPERATURE SHALL THEN BE REDUCED TO PREVAILING ROOM CONDITIONS.

4.1.1.3. UPON REACHING TEMPERATURE STABILIZATION, A PROOF CYCLE SHALL BE CONDUCTED.

4.1.1.4. THE CHAMBER TEMPERATURE SHALL NOW BE LOWERED TO -28° F. THIS CONDITION SHALL BE MAINTAINED FOR A PERIOD OF (72)^(?) HOURS

4.1.1.5. THE CHAMBER TEMPERATURE SHALL THEN



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BE RETURNED TO PREVIOUS TEST
CONDITIONS.

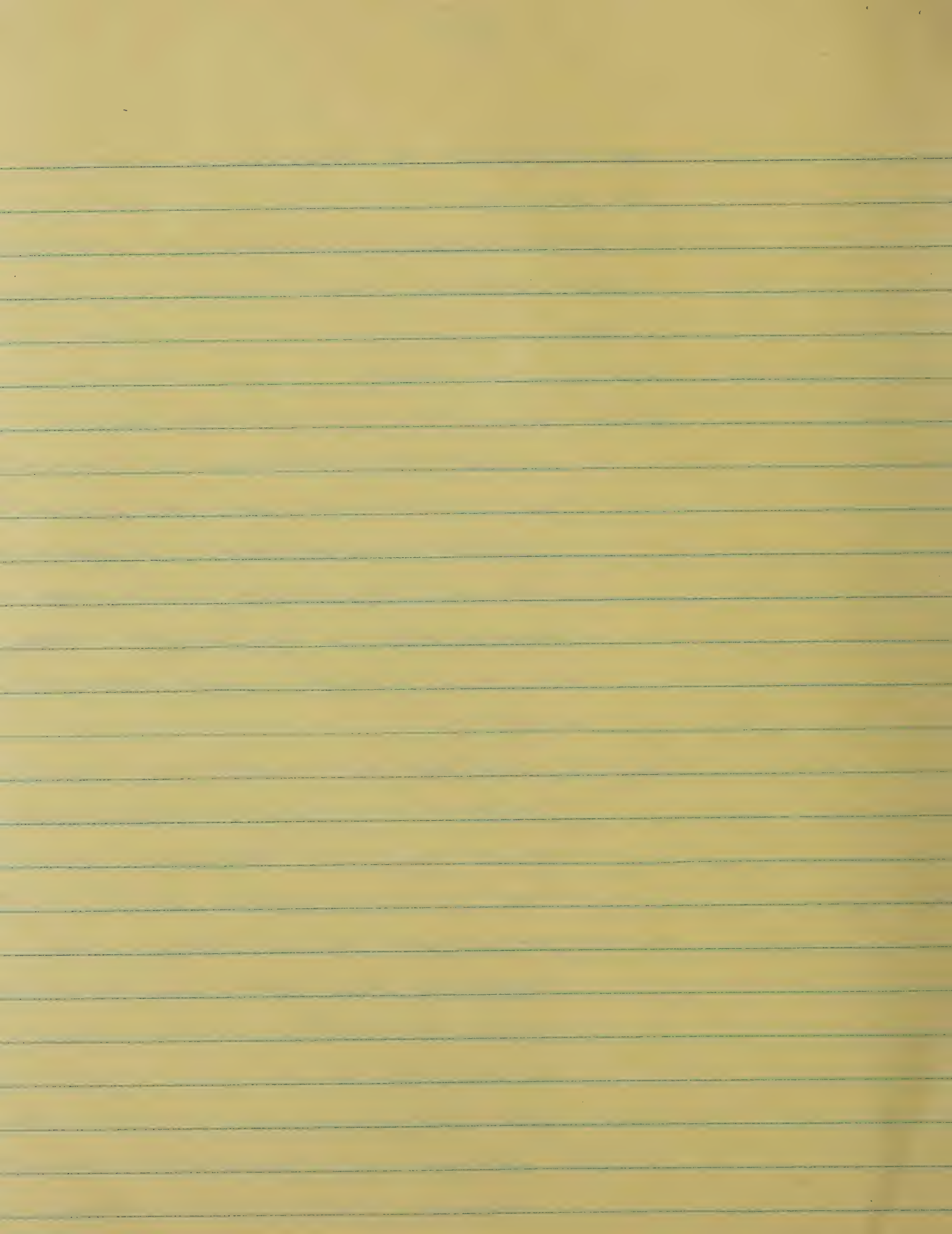
4.1.1.6 - AFTER REACHING TEMPERATURE STABILIZA-
TION, A PROOF CYCLE SHALL BE CON-
DUCTED.

4.1.2. HUMIDITY TEST.

4.1.2.1 THE SYSTEM WILL BE PLACED
WITHIN THE TEMPERATURE CHAMBER
AND PRESSION WILL BE MADE TO
PREVENT THE DRIPPING OF MISTURE
ONTO THE EQUIPMENT FROM THE TOP.
TEMPERATURE OF THE CHAMBER SHALL
BE ROOM AMBIENT WITH UNCONTROLLED
HUMIDITY.

4.1.2.2 DURING THE FIRST 2 HOUR
PERIOD, THE CHAMBER TEMPERA-
TURE WILL BE GRADUALLY RAISED
TO 125° F. (APPROX. 2 MIN PER 1°)
AT THE END OF THIS PERIOD THE
RELATIVE HUMIDITY WILL BE INCREA-
SED TO 90%. THESE VALUES
OF TEMPERATURE AND HUMIDITY
WILL BE MAINTAINED FOR 6 HOURS.

4.1.2.3 DURING THE FOLLOWING 16 HOUR
PERIOD THE TEMPERATURE



3.9 THE CHAMBER WILL BE GRADUALLY
REDUCED TO ROOM AMBIENT CONDITIONS,
AT WHICH TIME ONE CYCLE OF THE
HUMIDITY TEST WILL BE COMPLETED.

4.1.2.4. REPEAT 4.1.2. -- CYCLES
AND CONDUCT A DROE CYCLE IN
THE SYSTEM.

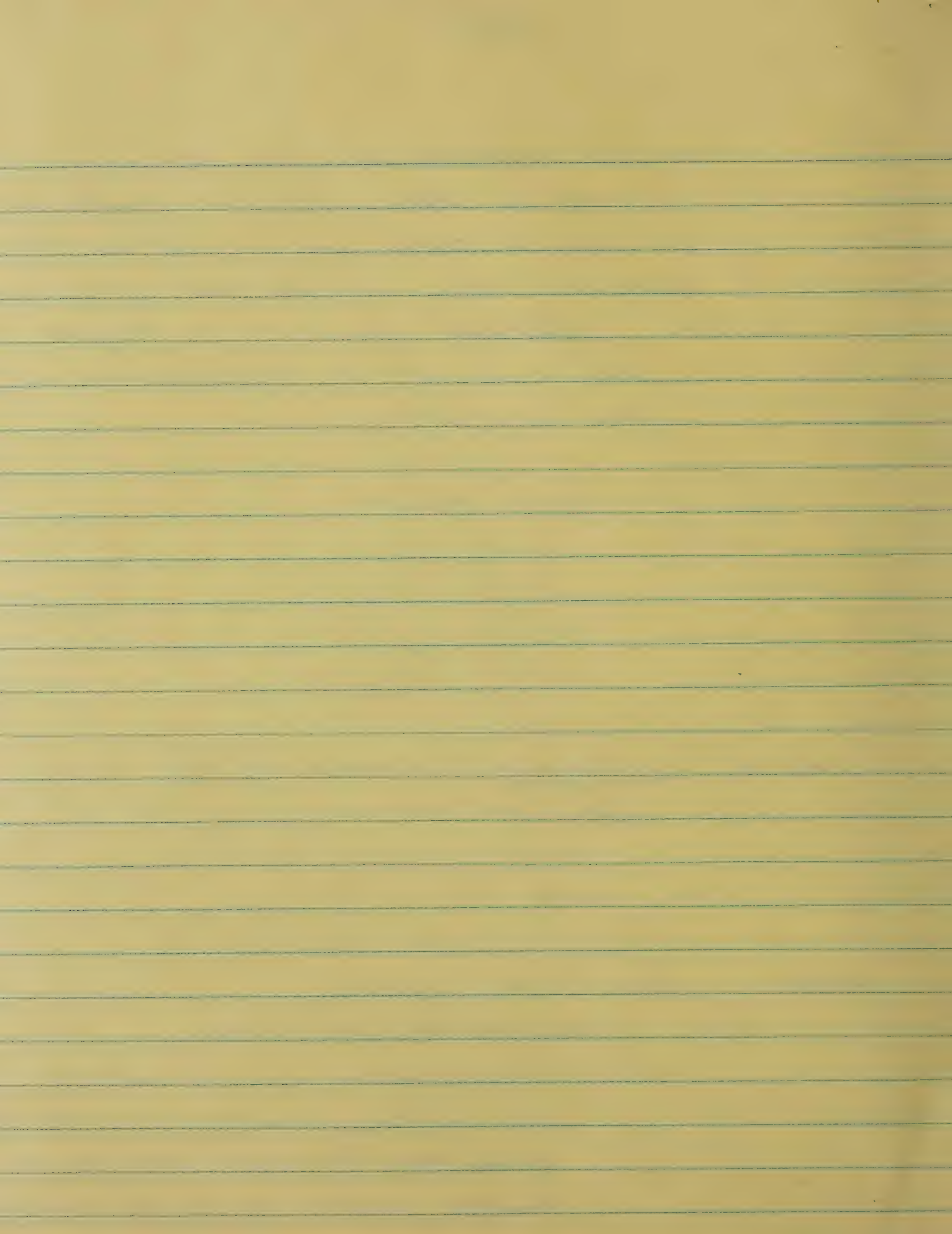
4.1.3. SHOCK TEST.

4.1.4 VIBRATION (PACKAGE) (2).

4.2. OPERATIONAL TESTS

4.2.1. TEMPERATURE-ALTITUDE.

4.2.1.1 THE SYSTEM WILL BE PLACED
WITHIN THE TEMPERATURE-ALTITUDE
CHAMBER. CABLES FOR AC/DC
POWER AND TO MONITOR SYSTEM



PARAMETERS WILL BE INITIATED WITH PROVISION FOR SWITCHING OUTSIDE OF CHAMBER.

4.2.1.2. THE TEMPERATURE OF THE CHAMBER WILL BE RAISED TO $+32^{\circ}\text{F}$. WHEN THE TEMPERATURE HAS STABILIZED, AT LEAST 1 HOUR, THE SYSTEM WILL BE OPERATED AND A PROOF CYCLE CONDUCTED.

4.2.1.3. THE CHAMBER WILL NOW BE EVACUATED TO 20.58 Hg OF MERCURY AND A PROOF CYCLE CONDUCTED ON THE SYSTEM. (AFTER THE SYSTEM HAS REMAIN OPERATING WHILE CHANGES ARE BEING MADE IN TEMPERATURE AND ALTITUDE TO SAVE TIME IF NECESSARY).

4.2.1.4. THE CHAMBER WILL NOW BE EVACUATED TO 13.76 Hg OF MERCURY AND HELD AT THIS PRESSURE FOR A PERIOD OF 1 HOUR AT WHICH TIME A PROOF CYCLE WILL BE CONDUCTED.

4.2.1.5. THE TEMPERATURE AND PRESSURE OF THE CHAMBER WILL BE ^{GRADUALLY} RES-
TORED TO ROOM AMBIENT. S
WHEN CONDITIONS IN THE
CHAMBER HAVE STABILIZED
A PROOF CYCLE WILL BE CON-
DUCTED.

4.2.1.6. THE CHAMBER TEMPERATURE
WILL NOW BE RAISED TO 110°F
AT ATMOSPHERIC CONDITIONS.
AFTER A PERIOD OF ONE
HOUR OR WHEN THE CHAMBER
HAS STABILIZED A PROOF CYCLE
WILL BE CONDUCTED.

4.2.1.7. THE CHAMBER PRESSURE WILL
BE REDUCED TO 20.52 Hg OF
MERCURY AND A PROOF CYCLE
CONDUCTED.

4.2.1.8. THE PRESSURE WILL NOW
BE CHANGED TO 13.76 Hg OF
MERCURY AND HELD AT THESE
CONDITIONS FOR ONE HOUR.
AT THE END OF THIS PERIOD
A PROOF CYCLE WILL CONDUCTED.

X

4.2.1.4. THE TEMPERATURE AND HUMIDITY WILL NOW BE GRADUALLY RETURNED TO ROOM AMBIENT. WHEN CONDITIONS IN THE CHAMBER HAVE STABILIZED A PROOF CYCLE WILL BE CONDUCTED.

4.2.2. HUMIDITY TEST

4.2.2.1 THE SYSTEM WITH THE HEDES SARY CABLES EXPOSED TO THE AIR WILL BE PLACED WITHIN THE TEMPERATURE CHAMBER. SOME PRECAUTIONS WILL BE MADE TO PREVENT THE DRAINAGE OF HUMIDITY INTO THE EQUIPMENT FROM ABOVE.

4.2.2.2 DURING THE FIRST TWO DAY PERIOD, THE CHAMBER TEMPERATURE WILL BE GRADUALLY RAISED TO 71°F . THE RELATIVE HUMIDITY THRU THIS TEST WILL BE TYPICAL 45%, WITH A MAXIMUM LIMIT OF 90%.

4.2.2.3. THE CHAMBER WILL BE MAINTAINED IN THE ABOVE CONDITIONS FOR A PERIOD OF 6 HOURS, AT WHICH TIME A PROOF CYCLE WILL BE CONDUCTED.

4.2.2.4. DURING THE FOLLOWING 16 HOURS THE TEMPERATURE AND RELATIVE HUMIDITY WILL BE REDUCED TO ROOM AMBIENT CONDITIONS. AT LEAST 3 PROOF CYCLES WILL BE CONDUCTED DURING THIS PERIOD OF TIME.

4.2.3. VIBRATION TEST.

4.2.3.1. THE SYSTEM WILL BE MOUNTED TO THE SHAKE TABLE LOCATING THE CENTER OF GRAVITY AS NEAR THE CENTER OF THE PLATFORM AS PRACTICAL.

4.2.3.2. POWER AND MONITORING EQUIPMENT WILL NOW BE APPLIED TO THE SYSTEM. ALLOW 5 MINUTES WARMUP.

4.2.3.3, THE SYSTEM WILL BE VIBRATED
IN THE THREE MAIN AXES IN
A $\frac{1}{2}$ OCTAVE PER MINUTE
SWEEP RATE FROM 5 CPS TO
2000 CPS, TWICE UPWARDS AND
TWICE DOWNWARDS IN 44 MINUTES
PER AXIS. IT SHALL BE CONSTANT
AMPLITUDE OF 0.5 INCHES PEAK
TO PEAK FROM 5 TO 12 CPS AND
CONSTANT $\pm 3g$ PEAK FROM
12 TO 500 CPS. DURING THE
SWEEP PERIOD THE SYSTEM
OUTPUTS - - - - -
- - - - -
SHALL BE RECORDED.

4.2.4 SHOCK TEST

